3.12 NOISE

This section explains noise and vibration terminology and concepts; describes existing noise levels in the SELRP areas; and identifies sensitive receptors in the surrounding communities. Project impacts are then identified and evaluated in light of applicable noise regulations, which are described in Appendix C. Noise impacts to sensitive species are addressed in Section 3.6 (Biological Resources).

Supporting technical information for this lagoon restoration element is provided in Appendix L. The analysis of noise related to materials placement is largely from the 2012 RBSP EA/EIR (SANDAG 2011).

3.12.1 AFFECTED ENVIRONMENT

Noise Terminology

Sound is a vibratory disturbance created by a moving or vibrating source that is capable of being detected by the hearing organs. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and, in the extreme, hearing impairment.

In its most basic form, a continuous sound can be described by its frequency or wavelength (pitch) and its amplitude (loudness). Frequency is expressed in cycles per second, or hertz. Frequencies are heard as the pitch or tone of sound. High-pitched sounds produce high frequencies; low-pitched sounds produce low frequencies. The amplitude of pressure waves generated by a sound source determines the loudness of that source, typically expressed as sound-pressure levels, described in units of decibels (dB).

The human ear is not equally sensitive to all frequencies within the sound spectrum. To accommodate this, the A-scale, which approximates the frequency response of the average young ear when listening to most everyday sounds, was devised. When people make relative judgments of the loudness or annoyance of a sound, their judgments correlate with the A-scale sound levels of those sounds. Therefore, the "A-weighted" noise scale is used for measurements and standards involving the human perception of noise. Noise levels using A-weighted measurements are written dB(A) or dBA.

Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, a doubling of the energy of a noise source, such as a doubling of traffic volume, would increase the noise level by 3 dB; a halving of

the energy would result in a 3 dB decrease. It is widely accepted that the trained ear, however, can barely perceive noise level changes of 3 dBA (Caltrans 2009).

Table 3.12-1 shows the relationship of various noise levels to commonly experienced noise events.

Table 3.12-1
Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1000 feet		
	— 100 —	
Gas lawn mower at 3 feet		
	— 90 —	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	— 80 —	Garbage receptor at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	**— 70 —**	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	**— 60 —**	
		Large business office
Quiet urban daytime	**— 50 —**	Dishwasher next room
Quiet urban nighttime	**— 40 —**	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	**— 0 —**	Lowest threshold of human hearing

Source: Caltrans 2009

Noise Descriptors

Several rating scales (or noise "metrics") exist to analyze adverse effects of noise on a community. These scales include the equivalent noise level (L_{eq}), the day/night average sound level (DNL or L_{dn}), and the community noise equivalent level (CNEL). Average noise levels over a period of minutes or hours are usually expressed as dBA L_{eq}, meaning the equivalent noise level for that period of time. The period of time averaging may be specified; $L_{eq(8)}$ would be a 8-hour average. When no period is specified, a 1-hour average is assumed. It is important to understand that noise of short duration, that is, time substantially less than the averaging period, is averaged into ambient noise during the averaging period. Thus, a loud noise lasting many

seconds or a few minutes may have minimal effect on the measured sound level averaged over a 1-hour period. To evaluate community noise impacts, the descriptor (CNEL) was developed to account for human sensitivity to nighttime noise. CNEL represents the 24-hour average sound level, with a 5 dB penalty for noise occurring during the evening and a 10 dB penalty for noise occurring at night.

Vibration Descriptors

Typical outdoor sources of perceptible ground-borne vibration and noise are construction equipment and traffic on rough roads. Construction activity can also result in varying degrees of ground-borne vibration, depending on the type of equipment, methods employed, and site geology.

Ground vibrations from construction activities do not often reach levels that can damage structures, but they can be noticeable in buildings close to construction activities. Structural damage due to vibration is assessed in terms of peak particle velocity (PPV) and expressed in units of inches per second (in/sec).

The rumbling sound caused by the vibration of built features is ground-borne noise, and is generally related to root mean square velocity levels expressed in vibration decibels (VdB). In contrast to airborne noise, ground-borne noise is not a phenomenon that most people experience every day. The background vibration velocity level in residential areas is usually 50 VdB or lower, which is well below the threshold of perception for humans of approximately 65 VdB.

Noise-Sensitive Receptors

Noise-sensitive receptors are generally considered humans engaged in activities, or utilizing land uses, that may be subject to stress of substantial interference from noise. Activities usually associated with sensitive receptors include, but are not limited to, studying, convalescence, and sleeping. Land uses often associated with sensitive receptors include residential dwellings, hotels and motels, hospitals, nursing residences, education facilities, and libraries.

The existing noise environment in this section highlights the noise-sensitive uses that would be exposed to noise sources with implementation of the proposed project. These receptors are located near the lagoon and adjacent to the materials placement sites (see Table 3.12-2). This section focuses on noise-sensitive receptors, as described above, and not all land uses. Specific adjacent land uses for each materials placement site are described in Section 3.1 (Land Use/Recreation).

Table 3.12-2
Overview of Activies and Noise-Sensitive Receptors by Basin

Basin	Proposed Activity	Nearest Noise-Sensitive Receptors (1,000 feet or less)
Coastal	Construction of new inlet south of the existing feature; construction of cobble blocking features	Homes on West Circle Drive; overnight campers at San Elijo State Beach
West	Creation of new subtidal basin just landward of the new inlet; demolition of existing Coast Highway 101 roadway; construction of a new Coast Highway 101 bridge at new inlet location; deepening of channels under Coast Highway 101 bridges; construction of armor slopes at bridge base with rock	Homes on West Circle Drive, Solana Point Circle, and San Elijo Avenue
Central	Creation of new subtidal basin just landward of the new inlet	Homes on West Circle Drive, Solana Point Circle, North Rios Avenue, and San Elijo Avenue
	Clearing, grubbing, and haul-off of vegetation	Homes along Manchester Avenue
	Widening and redirecting main tidal channel just west of Interstate 5 extending into east basin	Homes along Manchester Avenue: Cape Sebastian Place,Camino Ocean Cove, Ocean Cove Drive, and MacKinnon Ranch Road
	Over-excavation of proposed overdredge pit	Homes along Solana Point Circle, North Rios Avenue, Gibson Point, Barbara Avenue, and North Granados Avenue
	Construction of access road at north end of North Rios Avenue	Homes along Solana Point Circle and North Rios Avenue
East	Widening and redirecting main tidal channel just west of Interstate 5 extending into east basin	Homes along Santa Inez and Santa Hidalga
	Widening of existing channel in east basin and removing existing weir	Homes along Santa Inez and Santa Hidalga

Vibration-Sensitive Receptors

Vibration-sensitive receptors are generally considered humans engaged in activities, or utilizing land uses, that may be subject to substantial interference from vibration. Activities and land uses often associated with vibration-sensitive receptors (i.e., structures and humans in proximity) are similar to those associated with noise-sensitive receptors (Table 3.12-2).

Existing Noise Environment

San Elijo Lagoon. The lagoon area is surrounded by a predominantly urban/suburban environment. The primary noise source within the area is transportation noise; other adjacent land uses that generate noise include:

- Vehicular traffic on Coast Highway 101 and I-5
- Railroad noise and aircraft over-flights
- San Elijo Joint Powers Authority Wastewater Plant

- Retail and restaurant land uses
- Commercial and residential landscape maintenance
- Schools (Solana Vista Elementary School, Encinitas Country Day School, and the Mira Costa College Campus)
- Churches (North Coast Presbyterian Church, and Saint Constantine and Helen Greek Orthodox Church)

Vehicles traveling on local roadways, landscaping equipment, and recreational activities generate noise levels that typically range from 55 to 90 dBA at 50 feet from the source. As part of the Draft General Plan Update, the City of Encinitas has prepared noise contours for I-5, Coast Highway 101, and the NCTD rail line within the lagoon study area (City of Encinitas 2010). As shown in Figure 3.12-1, noise levels range from 80 dBA CNEL in the vicinity of I-5 to 55 dBA CNEL in the eastern end of the lagoon. Noise levels between I-5 and Coast Highway 101 range from 80 to 60 dBA CNEL, with higher noise levels occurring closer to I-5 and Coast Highway 101 and the adjacent NCTD railroad. Noise levels at the beach in northern San Diego are typically close to 70 dBA due to wave activity (SANDAG 2011).

The NCTD rail line runs adjacent to Coast Highway 101 in the west part of San Elijo Lagoon and is utilized by Burlington Northern Santa Fe Railway (BNSF) freight trains, Amtrak passenger trains, and NCTD commuter trains ("The Coaster"). Existing noise levels in the vicinity of San Elijo Lagoon due to rail activities currently reach up to 76 dBA CNEL at homes nearest the rail line.

To further document the existing noise environment and to establish baseline ambient noise levels, noise measurements were taken. One long-term (24 hours) and six short-term (20 minutes) noise measurements were taken using an ANSI Level 1 Larson-Davis 820 sound level meter on November 20 and 21, 2012. A 20-minute sample is considered a "snapshot" of the baseline noise environment at a given time; the sound level may vary depending on time, day, or season. Noise measurement locations are shown in Figure 3.12-1, and corresponding ambient long- and short-term noise levels can be found in Table 3.12-3. Short-term noise measurements ranged from 47.0 to 65.4 dBA L_{eq}. Vehicle noise on I-5 and Coast Highway 101 dominated the noise environment. The long-term measurement resulted in a CNEL of 61 dBA. Noise monitoring field data sheets output sheets are included in Appendix L.

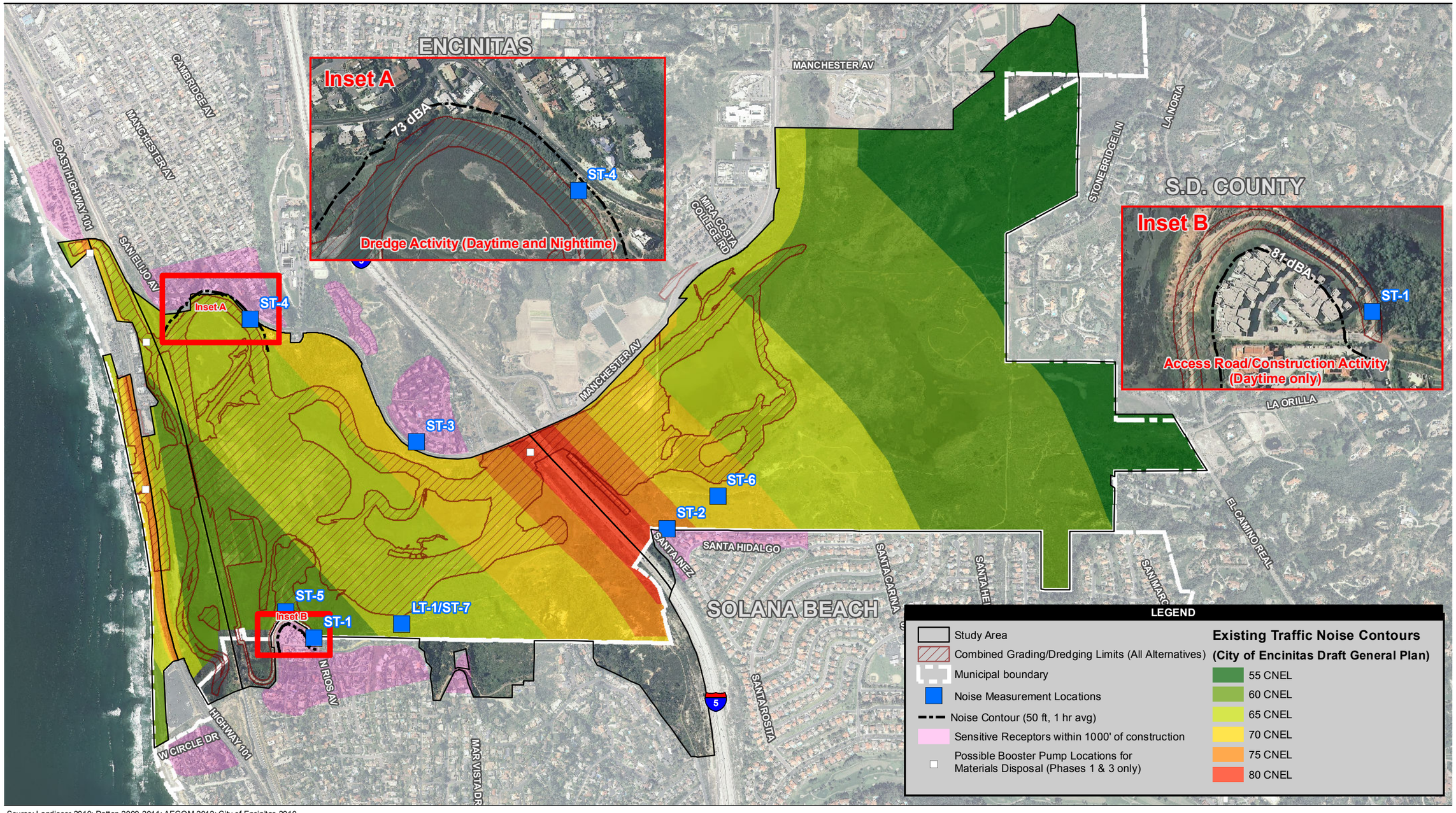
Table 3.12-3
Ambient Noise Measurements – San Elijo Lagoon

Noise Measurement #	L_{eq}	L_{max}
ST 1	50.6	65.7
ST 2	63.8	80.1
ST 3	48.6	60.7
ST 4	65.4	86.7
ST 5	53.2	58.2
ST 6	47.0	63.6
LT 1	61 dBA CNEL	n/a

ST = Short term
LT = Long term

Material Placement/Reuse Sites. Ambient noise measurements previously taken in support of the 2012 RBSP (SANDAG 2011) are representative for each of the proposed onshore materials placement sites. The principal source of noise at onshore materials placement sites is surf activity of the ocean, primarily breaking waves and the interaction of water, rocks, and sand in the surf area. Noise levels vary with the tide, wave height, and sand-rock composition, but in general onshore materials placement sites have relatively high background noise levels due to constant surf activity. This is typical of a beach environment. The proposed beach placement sites are also open to the public and have frequent recreational users and special events that generate noise, particularly during the warmer months. At night, noise generated by people using the beach decreases, but the primary source of noise from wave activity continues at the same levels as during the daytime. The measured noise levels, and additional noise sources associated with the individual materials placement sites, are described in Table 3.12-4. Figures 2-11A through 2-11E illustrate beach placement sites relative to adjacent coastal land uses.

There are no noise measurements at the offshore sites (LA-5 and SO-5/SO-6) because these sites are located a minimum of 0.5 mile from the coast and do not have sensitive receptors in proximity. Noise sources in the vicinity of offshore materials placement sites are primarily weather- and ocean-related but can also include aircraft over-flights, and military, commercial and pleasure-related boating activities.



Source: Landiscor 2010; Patton 2009-2011; AECOM 2012; City of Encinitas 2010

1,100 550 0 1,100 Feet

Scale: 1:13,200; 1 inch = 1,100 feet

Figure 3.12-1
San Elijo Lagoon
Noise Conditions

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Table 3.12-4
Existing Noise Environment at Sand Placement Sites

Sand Placement Site	Noise Sources	Ambient Noise Level (L_{eq})	Nearby Sensitive Noise Receptors
Moonlight Beach	Ocean wave noise, residential and commercial landscape equipment, vehicular traffic on the local arterial system, highways, and freeways; rail noise and aircraft over-flights.	Beach – 70 dBA. Nighttime noise at residences close to the beach – 67 to 68 dBA.	Single- and multi-family residences adjacent to the north end of the beach. The southernmost house is beach level, with a porch adjacent to the materials placement site.
Leucadia	Ocean wave noise, residential landscape equipment, vehicular traffic on the local arterial system, highways, and freeways; rail noise and aircraft over-flights.	Residences above the beach – 63 to 66 dBA (nighttime). Materials placement site location 25 feet west of the bluff – 69 dBA.	Residences along Neptune Avenue on the bluffs approximately 60 to 80 feet above the beach.
Cardiff	Ocean wave noise, residential and commercial landscape equipment, vehicular traffic on the local arterial system, highways, and freeways; rail noise and aircraft over-flights.	Top of the bluff – 68 dBA. Nearby rest area – 64 dBA.	Residences east of Coast Highway 101 and the railroad at least 900 feet north and south of the sand placement site. Overnight campers at San Elijo State Beach, approximately 1,500 feet from the placement site.
Solana Beach	Ocean wave noise, residential landscape equipment, vehicular traffic on the local arterial system, highways, and freeways; rail noise and aircraft over-flights.	Residences on the bluffs above the beach – 63 to 66 dBA. Materials placement site 35 feet west of the bluff on the beach – 69 dBA.	Residences along Helix Avenue and South Sierra Avenue, on the bluffs – approximately 65 feet above the beach.
Torrey Pines	Ocean wave noise, residential landscape equipment, vehicular traffic on the local arterial system, highways, and freeways; rail noise and aircraft over-flights.	At 20 feet west of a rock berm at beach level – 69 dBA.	Residences and businesses approximately 2,000 feet from the sand receptor site (near Carmel Valley Road).

Source: SANDAG 2011

Noise Regulations

Federal and state noise regulations have been established to protect public health and safety and prevent disruption of various human activities. The EPA Office of Noise Abatement and Control was established to coordinate federal noise control activities an after its inception, issued the federal Noise Control Act of 1972, which established programs and guidelines to identify and address the effects of noise on public health and welfare and the environment. However, EPA

transferred responsibilities for regulating noise control policies from the federal government to state and local governments.

Local jurisdictions have established criteria to regulate noise through the development of general plan noise elements and noise ordinances, which are generally intended to promote and/or protect the public health and comfort of residents. Therefore, activities conducted in compliance with local noise ordinances would not result in significant impacts. Noise ordinances can restrict both overall noise levels generated, as well as hours of specific activities, regardless of noise generated. If an activity operates outside of the limits set by ordinances, a noise variance can be granted by the jurisdiction, particularly if the project is in the interest of the public and provides a public benefit. If a variance is not granted, activities can only proceed in compliance with the ordinance. Applicable regulations are detailed in Appendix C of this EIR/EIS, but within the cities of Solana Beach and Encinitas and San Diego County, construction work is prohibited between the hours of 7:00 p.m. and 7:00 a.m. on weekdays and Saturdays, and on Sundays and holidays, unless a variance is granted. In addition, there is an 8-hour average construction noise level limit for San Diego County and the City of Solana Beach of 75 dBA $L_{eq(8)}$ between 7:00 a.m and 7:00 p.m. measured at the property line, and a construction noise level limit for Encinitas of 75 dB not to be exceeded for more than 8 hours between 7:00 a.m and 7:00 p.m. per 24-hour period measured at the property line. Many of the materials placement sites are located within California State Parks (Leucadia, Moonlight, Cardiff, and Torrey Pines), which do not regulate construction noise hours or levels. While regulations within some of the sites would not affect placement, noise levels at nearby sensitive receptors within adjacent jurisdictions are also identified as part of the analysis below.

Vibration Regulations

There are no specific regulations for vibration from the County of San Diego or cities of Solana Beach or Encinitas. The Federal Transit Administration (FTA) provides guidance for analysis of groundborne noise and vibration related to transportation and construction-induced vibration. The proposed project is not subject to FTA; however, these FTA guidelines serve as a useful tool to evaluate vibration impacts. With respect to human response within residential uses (e.g., annoyance, sleep disruption), FTA recommends a maximum acceptable vibration standard of 80 VdB (FTA 2006).

Caltrans also provides guidance for analysis of groundborne noise and vibration. The proposed project is not subject to Caltrans regulations; however, these guidelines serve as another useful tool to evaluate vibration impacts. Caltrans guidelines recommend that a standard of 0.2 in/sec PPV not be exceeded for the protection of normal residential buildings, and that 0.08 in/sec PPV not be exceeded for the protection of old or historically significant structures (Caltrans 2004).

3.12.2 CEQA THRESHOLDS OF SIGNIFICANCE

A significant impact related to noise would occur if implementation of the proposed project would:

A. Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies,

B. Expose persons to or generate excessive groundborne vibration or groundborne noise levels,

C. Result in a substantial permanent increase in ambient noise levels in the SELRP vicinity above levels existing without the SELRP, and

D. Result in a substantial temporary or periodic increase in ambient noise levels in the SELRP vicinity above levels existing without the SELRP.

The thresholds above are from CEQA Appendix G.

3.12.3 ENVIRONMENTAL CONSEQUENCES

The project is habitat restoration, so there are no permanent structures being built that would generate noise. Noise generation would be from the multi-year construction period. Periodic maintenance would be the only "permanent" potential for noise increase, and that would vary by alternative. The lagoon noise analysis is generally structured around the type of noise-generating construction activity, instead of by significance threshold. Thus, the various types of construction activities (on-road noise, off-road noise, and dredging) are considered relative to the standards of the three local jurisdicitons for daytime and nighttime operations (Criterion A); changes to ambient noise levels with and without the project (Criterion D) are also considered. The issues of vibration and permanent noise are addressed holistically instead of by construction activity type (Criteria B and C). The materials disposal analysis reflects a different type of construction activity; this project element would not be permanent.

Lagoon Restoration

Alternative 2A–Proposed Project

On-Road Vehicle Noise during Construction (Daytime Activities)

Local roadways that would handle the bulk of project construction traffic include I-5, Coast Highway 101, Manchester Avenue, and Lomas Santa Fe. Project trip distribution is provided in

the traffic study prepared for the project (Appendix J) and discussed in Section 3.10 (Traffic, Access, and Circulation). Existing and existing plus project traffic noise levels were modeled using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (RD-77-108). Output data sheets are provided in Appendix L. As shown in Table 3.12-5, project construction traffic would not result in detectable increases in ambient noise levels at nearby sensitive receptors along affected roadways.

Table 3.12-5
On-Road Construction Traffic and Affected Noise-Sensitive Receptors

Affected Road Segment	Affected Sensitive Receptors	Noise Levels with and without Project Traffic CNEL/CNEL[1]	Noise Levels with and without Project Traffic L_{eq}/L_{eq}[1]
Coast Highway 101	Coastal. Homes on West Circle Drive, Overnight campers at San Elijo State Beach West Basin. Single-family residences along San Elijo Avenue, West Circle Drive, Acadia Avenue, Solana Point Circle and Seabright Lane	70/70	60/60
Manchester Avenue	Central Basin. Homes along Manchester Avenue, west of I-5 East Basin. NA	63/63	52/52
Lomas Santa Fe	Homes along Lomas Santa Fe	68/68	57/57
Chesterfield Drive	Homes along Chesterfield Drive	63/63	52/52

[1] Noise levels are modeled at 50 feet from centerline of respective roadways. Project traffic study is included as Appendix J. FHWA Output Data is included in Appendix L.

Another analysis was conducted utilizing the FHWA Highway Traffic Noise Prediction Model to evaluate the noisiest traffic hour that is expected to occur during project construction. This hour is expected to occur during the demolition of existing Coast Highway 101 and construction of a bridge to span the new lagoon inlet. Construction of the bridge would involve both demolition and construction, both of which would be variable in terms of worker and truck traffic generation. Worst-case construction traffic volumes associated with these activities would include 20 employee vehicles and 15 trucks arriving to the site. Traffic noise levels are expected to reach 47 dBA L_{eq} and 48 dBA CNEL. The model output sheets for this analysis are provided in Appendix L. Even if applied to the quietest measured location in the lagoon area (47 L_{eq} at ST-6 east of I-5), worst-case project construction traffic noise would not result in substantial temporary increase in ambient noise levels. Traffic noise needs to double to achieve a 3 dBA increase, an increase that is barely audible to a trained ear (Caltrans 2009). **Impacts would not be substantially adverse and would be less than significant (Criterion D).**

The subject traffic on nearby roads would occur during the routine contruction time period of 7 a.m. to 7 p.m. (or daylight hours). Nighttime work would be associated with dredging inside the lagoon; this is addressed seperately below. Thus, the on-road element of construction would be consistent with applicable standards. **Impacts would not be substantially adverse and would be less than significant (Criterion A).**

Off-Road Vehicles and Construction Equipment (Daytime Activities, Excluded Dreding)

Noise levels associated with typical off-road vehicles and construction equipment that may be used on the project site are presented in Table 3.12-6 (dredging equipment is discussed separately below). Also, construction equipment has mandatory backup alarms. Therefore, the equipment noise presented in Table 3.12-6 would be accompanied at times by backup alarm noise.

Table 3.12-6
Noise Levels of Typical Construction Equipment

Equipment	Maximum Noise Level (dBA) 50 Feet from Source
All other equipment (5 HP or less)	85
Backhoe	80
Compactor (ground)	80
Compressor (air)	80
Dozer	85
Dump Truck	84
Excavator	85
Flat Bed Truck	84
Front End Loader	80
Generator (25 KVA or less)	70
Generator (more than 25 KVA)	82
Grader	85
Drill Rig Truck	84
Pumps	77
Soil Mix Drill Rig	80
Tractor	84

HP = horsepower; KVA = kilovolt ampere
Source: FTA 2006

A worst-case equipment usage scenario was developed to assess potential noise impacts associated with off-road equipment. The equipment scenario includes two dump trucks, a bulldozer, and a large backhoe operating concurrently and in proximity to each other. Over a period of 1 hour, the equipment would operate at an assumed load factor of 40 percent (toaccount for worker breaks, change in construction activities, and maintenance), resulting in an average noise level of approximately 81 dBA L_{eq} at 50 feet, which would decrease

conservatively (for a hard acoustic surface) by approximately 6 dBA with each doubling of distance. For example, the above worst-case scenario of approximately 81 dBA L_{eq} at 50 feet would attenuate to 75 dBA L_{eq} at 100 feet, and 69 dBA Leq at 200 feet. Therefore, construction noise is of greatest concern when construction activity is closest to adjacent residential property lines.

The allowable construction noise level limit at residential property lines for the cities of Solana Beach and Encinitas and the County of San Diego is not to exceed an 8-hour average noise level of 75 dBA $L_{eq(8)}$ at a residential property line during the allowable construction hours of 7 a.m. to 7 p.m. The proposed project's worst-case 1-hour average construction noise level of 81 dBA $L_{eq(1)}$ at 50 feet from a residential property line must be evaluated when averaged over an 8-hour period.

Figure 3.12-1 identifies areas of sensitive receptors within 1,000 feet of construction activity (including dredging) associated with lagoon restoration (see pink shading). As shown, sensitive receptors 1,000 feet or less from the activity are primarily west of I-5, with a single row of homes in that radius east of I-5 in Solana Beach.

Figure 3.12-1 also illustrates the location of the 81 dBA L_{eq} noise contour (1-hour average) in relation to sensitive receptors located adjacent to, or within, that key contour. The two inserts in the figure reflect varying conditions. Insert A reflects the only place where nighttime dredging would be within 1,000 feet of residences (dredging impact evaluation is below). Insert B illustrates the residences that are closest to non-dredging construction activities (daytime only) and denotes the 81 dBA L_{eq} relative to the units.

Sensitive receptors in Insert B are primarily on the small hill overlooking the lagoon. Construction activity at the dirt road highlighted in Insert B (off North Rios Avenue) would be periodic (deliveries, crew changes, etc.). Given periodic use, standard construction worker breaks, and on-site construction equipment/vehicle repositioning and maintenance, the transitory vehicular construction sound level limit averaged over an 8-hour period would be less than 75 dBA $L_{eq(8)}$ at any particular property line. Therefore, noise levels would not exceed the 75 dBA $L_{eq(8)}$ construction noise level limit established by the cities or County. To further minimize noise levels at adjacent residences, construction equipment, fixed or mobile, would be equipped with properly operating and maintained mufflers (PDF-8).

Removal of vegetation materials cleared from the lagoon would primarily occur through Site 7 (Figure 2-15), which would be sited adjacent to the I-5 on-/off-ramps to limit encroachment into adjacent neighborhoods. The site is located within the existing 75 dBA CNEL contour as identified by Encinitas, and is affected by traffic along the key regional highway I-5. Equipment

at this site would be at least 300 feet from the nearest residential property line. Truck trips in and out could start early and end late to maximize operational hours of the landfill, but would remain within the 7 a.m. to 7 p.m. window. Vegetation removal is anticipated to occur over a 6-month period. In an 8-hour average, noise levels would not exceed the 75 dBA $L_{eq(8)}$. **Impacts at the worst-case residential location (Insert B) or vegetation removal staging area (Site 7) would not be substantially adverse and would be less than significant (Criterion A).**

Dredging within San Elijo Lagoon (Daytime and Nighttime Activities)

Areas proposed for dredging are shown in Figure 3.12-1. Dredging may be achieved with diesel and/or electric hydraulic dredges. Dredges can be very different from each other, with some engines totally enclosed, and others exposed on the deck, which are louder. Exposed engines can be housed to reduce noise. For the purposes of this analysis, both electric and diesel dredges are evaluated.

The exact horsepower, location, and configuration of the diesel engines and electric motors that would be part of the dredging system have not yet been determined. Noise produced from a hydraulic dredging operation within the Newport Bay area was measured to provide a reasonable noise estimate; specifically, an average noise level of 73 dBA L_{eq} at 50 feet (USFWS and SDRPJPA 2000). This noise level is consistent with a diesel dredge measured near Ross Island with the engine room door open (Ross Island 1999). The precise electric dredge that could be used for the SELRP is also not known at this time. It is likely that noise levels would be comparable to or less than the electric dredge that is used to dredge the navigation channels in the Port of Los Angeles, which generates 71.5 dBA L_{eq} at 50 feet (USFWS and SDRPJPA 2000). Use of a diesel dredge represents the worst-case scenario. For purposes of this analysis, a noise reference level of 73 dBA L_{eq} at 50 feet for a diesel dredge is reasonable, and dredge noise levels would increase to 75 dBA L_{eq} at a closer distance of 40 feet from the dredge. Exposed engines on dredging equipment would be housed when possible to further reduce noise levels at residences adjacent to active dredging (PDF-9), but that reduction is not factored into this analysis.

Because the dredge equipment would be much farther than 40 feet from sensitive receptors for the vast majority of construction, the 8-hour average construction noise level limit of 75 dBA $L_{eq(8)}$ for the City of Encinitas, City of Solana Beach, and County of San Diego would not be violated during daytime dredging activities. The one area where the dredge would be within 40 feet of residential property lines in illustrated in Insert A. Here, during the day, the dredge would be mobile over an estimated 6 months, generally near Coast Highway 101 and the along the channel along both sides of the NCTD railroad. Because of its mobile nature, noise levels would not exceed the 75 dBA $L_{eq(8)}$ during the permitted daytime operating hours at any one property

line. **Impacts would not be substantially adverse and would be less than significant (Criterion A).**

Dredging activities are possible within the lagoon 7 days a week, 24 hours a day. As noted above, noise thresholds limiting sound levels to 75 dBA $L_{eq(8)}$ during a 24-hour period would not be exceeded. However, due to proposed dredging outside of permitted daytime hours, variances would be required from the cities of Encinitas and Solana Beach and the County in order to operate dredging equipment on Sundays, holidays, and Mondays through Saturdays between 7 p.m. and 7 a.m. With issuance of a variance, 24-hour operations could occur, and **impacts would not be substantially adverse under NEPA. Even with an approved variance, impacts would be considered significant under CEQA (Criterion A).** If no variance is issued to allow nighttime work, dredging would be restricted to daytime hours in compliance with local noise regulations.

Vibration and Long-Term Maintenance (Daytime Activities)

Vibration-inducing construction equipment could include vibratory rollers, hoe rams, dozers, jackhammers, and haul trucks. With the exception of the dozers/trucks, these are generally not associated with restoration dredging and habitat restoration, but could be used as part of Coast Highway 101 modifications and CBF installation at the new inlet. Although construction activities could generate perceptible vibrations to people in the immediate vicinity of the inlet/bridge construction sites, vibration levels dissipate rapidly over short distances (i.e., 50 feet). Ground-borne noise and ground-borne vibration levels associated with typical construction equipment are presented in Table 3.12-7. Actual vibration levels are dependent on construction procedures, soil and geologic conditions, and the structural characteristics of the buildings.

As shown in Table 3.12-7, a vibratory roller has the highest groundborne vibration level of 0.21 in/sec PPV at 25 feet and 0.074 in/sec PPV at 50 feet. The vibratory roller generates a groundborne noise level of 94 VdB at 25 feet and 85 VdB at 50 feet. Vibration may be perceptible to a small number of people closest to the proposed inlet and bridge construction activities (within 50 feet). These closest receptors would be mobile beach users who would experience the vibration intermittently, not stationary residents inside buildings. The nearest residents would be approximately 1,000 to 1,500 feet to the north. At these more distant locations, vibration would be well below the Caltrans guidelines recommended standard of 0.2 in/sec PPV for the protection of normal residential buildings (Caltrans 2004), and less than the FTA guidelines recommended standard of 80 VdB maximum for human annoyance within residential buildings (FTA 2006). **Impacts would not be substantially adverse and would be less than significant (Criterion B).**

Table 3.12-7
Groundborne Vibration and Noise Levels for Typical Construction Equipment

Equipment	Peak Particle Velocity in Inches per Second			Approximate Lv in VdB[1]				
	Groundborne Vibration PPV (in/sec) at 25 Feet	At 50 Feet	At 100 Feet	Ground-borne Noise Lv (VdB) (1 micro-inch/second at 25 Feet	At 50 Feet	At 75 Feet	At 100 Feet	At 150 Feet
Clam Shovel Drop (slurry wall)	0.202	0.071	0.025	94	85	80.5	76	71.5
Vibratory Roller	0.210	0.074	0.026	94	85	80.5	76	71.5
Hoe Ram	0.089	0.031	0.011	87	78	73.5	69	64.5
Large Bulldozer	0.089	0.031	0.011	87	78	73.5	69	64.5
Caisson Drilling	0.089	0.031	0.011	87	78	73.5	69	64.5
Loaded Trucks	0.076	0.027	0.010	86	77	72.5	68	63.5
Jackhammer	0.035	0.012	0.004	79	70	65.5	61	56.5
Small Bulldozer	0.003	0.001	0.0004	58	49	44.5	40	35.5

Source: Federal Transit Administration: Transit Noise and Vibration Impact Assessment, 2006
Note: These values are based on the field studies conducted by the FTA (2006). Actual vibration levels are dependent on construction procedures, soil and geologic conditions, and the structural characteristics of the receptors.
1LV = velocity level in decibels (VdB) referenced to 1 microinch per second and based on the root mean square velocity amplitude

There would be no permanent noise-generating uses associated with the project. Long-term maintenance activities would be required every 3 to 4 years under this alternative to remove approximately 300,000 cy of material for placement on the adjacent Cardiff beach. Other maintenance requirements would be determined during the long-term monitoring program, and may include plant replacement, weed abatement, trash removal, and bank protection repair. Impacts associated with maintenance dredging and bank repair would be less than those described above under temporary impacts, and would generate temporary and negligible amounts of noise. **No substantial adverse impacts would occur. Impacts would be less than significant (Criterion C).**

Alternative 1B

Because no new inlet would be constructed and Coast Highway 101 bridge work would be limited to retrofitting the existing structure, construction traffic operations and equipment noise associated with Alternative 1B would be less than those described under Alternative 2A. Specific trip generation numbers may vary by basin, but would not be in excess of numbers analyzed for Alternative 2A. Therefore, the noise traffic analysis discussed above for Alternative 2A is also applicable to this alternative. **Impacts would not be substantially adverse and would remain less than significant (Criteria A and D).**

Dredging and other construction noise and vibration associated with this alternative would be less than noise and vibration generated by Alternative 2A due to the smaller footprint and no construction of a bridge/inlet, resulting in a shorter period of project noise levels at sensitive receptors. While the noise standard of 75 dBA $L_{eq(8)}$ shared by the City of Encinitas, City of Solana Beach, and County of San Diego would not be violated during daytime hours, nighttime and weekend dredging activities are proposed within the lagoon. Variances would be required from the cities of Encinitas and Solana Beach to operate dredging equipment on Sundays, holidays, and Mondays through Saturdays between 7 p.m. and 7 a.m. With issuance of a variance, 24-hour operations could occur, and **impacts would not be substantially adverse under NEPA. Impacts would be considered significant under CEQA (Criterion A).**

Permanent noise from maintenance and vibration associated with Alternative 1B would be less than that described under Alternative 2A. The primary possible vibration source (new inlet and CBF) would not be constructed under this alternative. Maintenace of the channel would involve approximately 40,000 cy annually, would occur over 4 weeks during daytime hours, and would be focused under Coast Highway 101 and in the channel between Coast Highway 101 and the railroad. This would be similar to the existing inlet maintenance location, and would not exceed the City of Encinitas 75 dBA $L_{eq(8)}$. Short-term noise levels at sensitive receptors **would not be substantially adverse and would be less than significant (Criteria B and C).**

Alternative 1A

Construction traffic operations and equipment noise associated with Alternative 1A would be less than that for Alternative 1B because there would be less grading and material redistribution. The noise analysis related to traffic noise discussed above for Alternative 2A would be worst-case because it involves maximum grading and construction of a new bridge/inlet, and Alternative 1A would have no substantial adverse or significant impacts. Dredging and other construction noise and vibration associated with Alternative 1A would be less than noise and vibration generated by Alternative 2A or Alternative 1B, due to the smaller footprint. Noise standards for the cities of Encinitas and Solana Beach and the County would not be violated during daytime hours. Nighttime and weekend dredging activities are proposed within the lagoon, outside of permitted hours. Variances would be required from the cities of Encinitas and Solana Beach in order to operate dredging equipment on Sundays, holidays, and Mondays through Saturdays between 7 p.m. and 7 a.m. With issuance of a variance, 24-hour operations could occur. **Impacts would be considered significant under CEQA (Criterion A only), even if a variance were issued. Temporary impacts would not be substantially adverse and would remain less than significant (Criterion D), as would vibration impacts (Criterion B). No substantial adverse impacts would occur under NEPA (all criteria).**

Permanent noise associated with routine inlet maintenance of Alternative 1A is expected to be similar to Alternative 1B and existing activities. **Impacts would not be substantially adverse and would remain less than significant (Criterion C).**

No Project/No Federal Action Alternative

The No Project/No Federal Action Alternative would not result in construction-related vehicle trips, modification of Coast Highway 101, or dredging activities, beyond existing periodic inlet opening. **The No Project/No Federal Action Alternative would not impact the noise environment and, therefore, would not be substantially adverse. Impacts would be less than significant (Criteria A, B, C, and D)**.

Materials Disposal

The SELRP is proposing to utilize many of the same sites for material placement that were analyzed as sites for the 2012 RBSP. The following discussion is largely based on the 2012 RBSP EA/EIR (SANDAG 2011). Figures 2-11A through 2-11F are useful for reference in this discussion, as well as Table 3.12-4.

The principal project noise at sensitive receptors during sand placement would be from construction equipment as the sandy material is moved around the beach and delivery pipelines are assembled and disassembled. Materials placement would possibly occur 24 hours per day, 7 days per week (similar to dredging). Both of the prior similar regionwide beach nourishment projects were constructed via the 24/7 approach.

At the materials placement sites, diesel engines would be used in bulldozers, loaders, forklifts, and cranes, as required. Noise levels vary, as equipment may come in different sizes and with engines of varying horsepower. Construction equipment noise levels also vary as a function of activity level or duty cycle. In a typical construction project (without pavement cutting or breaking), the loudest short-term noise levels are those of earthmoving equipment under full load, which would be approximately 85 dBA L_{max} at a distance of 50 feet from the source. However, with equipment moving from one point to another, work breaks, and idle time, the long-term noise level averages are lower than louder short-term noise events. For purposes of analysis of the proposed project, a maximum 1-hour average noise level of 80 dBA L_{eq} at 50 feet from the center of construction activities is assumed to occur (SANDAG 2011). Noise levels averaged over longer period such as 8 hours would be further reduced to below a 75 dBA $L_{eq(8)}$ for the same reasons; i.e., daily mobilization, moving from one point to another, work breaks including lunch, idle time, and daily demobilization over an 8-hour period. Materials placement

is completed from one end of the site to the other, and work along approximately 100–200 feet of beach can typically be completed per day.

Representative noise levels were taken for the 2012 RBSP EA/EIR at Imperial Beach and Mission Beach during sand deposition/maintenance activities similar to those expected to occur with implementation of the proposed project (SANDAG 2011). Working noise levels were measured, and then ambient background noise was mathematically removed, to generate an estimated noise level of 74 to 77 dBA at a distance of 50 feet. Idling noise levels were estimated at 65 to 68 dBA at 50 feet. These are considered typical noise levels for beach equipment that may be used for the SELRP, and the referenced 80 dBA L_{eq} at 50 feet used in this analysis for impact determination is conservative. It is also noted that construction equipment is equipped with mandatory backup alarms, and sand distribution requires construction equipment to back up frequently. Therefore, the diesel engine noise would be accompanied at some times by backup alarm noise.

There may be a need to pump the sand/water slurry mixture for distances greater than 10,000 feet (Phases 1 and 3 only). Figure 3.12-1 identifies four possible pump locations: one by I-5, two near bends in the channel at the existing inlet and near the railroad bridge, and one near the possible new channel. Diesel engines for slurry pumps are typcially housed in an enclosure that provides noise reduction. A noise level of 77 dBA at 50 feet is assumed (FTA 2006).

After materials placement/disposal is completed, no additional operational noise would occur; therefore, the analysis below focuses on construction. **No significant permanent noise impacts would occur under the project alternatives for materials disposal/placement (Criterion C). No substantial adverse impacts would occur (NEPA).**

Alternative 2A–Proposed Project

Moonlight Beach and Cardiff Beach – Beach Receptors

Sand placement sites at Moonlight Beach (Figure 2-11B) and Cardiff Beach (Figure 2-11C) have either beachfront residences, restaurants, or public open space at generally the same elevation as the sites. Residences at Moonlight Beach are within 50 feet of the nearest points of planned sand placement only at the northern and southern termini of the site. The vast majority of the site is adjacent to Moonlight Park. Residences in the area of Cardiff Beach are more than 900 feet north and south of the proposed sand placement site, but restaurants are within 50 feet of the sand placement. Dominant existing noise sources at these two locations are surf activity and traffic on nearby local roads. Ambient noise levels at sensitive receptors adjacent to these beaches range from 64 to 70 dBA L_{eq}.

During sand placement, the principal project noise at beachfront residences and restaurants would be from construction equipment. Sand placement activities may reach up to 80 dBA L_{eq} at the homes closest to the sand placement area at Moonlight Beach. When averaged over an 8-hour period, sand placement activities would include some periods with little or no equipment noise (e.g., when equipment repositions to different locations or shifts up or down the beach). Therefore, sand placement activities would have average noise levels of less than the 75 dBA $L_{eq(8)}$ guidance for the cities of Solana Beach and Encinitas and the County of San Diego.

Noise levels associated with sand placement would attenuate to ambient noise levels at distances of 100–175 feet from the spreading equipment. Sand placement activities would not be audible at the homes or the campground sites closest to the Cardiff Beach placement site.

When nighttime sand placement occurs within 100 feet of a residence, the change in noise environment is anticipated to disturb the sleep of some residents. This situation would occur only at the Moonlight Beach site and only at the northern and southern ends of the reciever site. A noise variance would be required to conduct nighttime sand placement. Closing windows would reduce the noise level, but the change in the volume and character of the noise may still disturb sleep. To minimize impacts to individual residents, they would be notified 1 week in advance of nighttime construction work that would occur within 100 feet, and work would last no longer than 3 consecutive nights within 100 feet (PDF-62). **No substantial adverse impacts would occur under NEPA. Impacts would be considered significant under CEQA by the County of San Diego for nighttime sand placement (Criteria A and D).**

Up to three booster pumps may be located within and near the Cardiff receiver site (Figure 3.12-1). If the pump is located at least 250 feet from a sensitive receptor, then the noise at the receptor would be 56 dBA L_{eq}. This noise would be at least 5 dBA below ambient noise levels. The pumps would range from approximately 250 to 1,500 feet from the nearest sensitive receptors, with the closest pump south of the existing inlet and south of the campground. **No substantial adverse impacts would occur under NEPA. Impacts would be considered significant under CEQA due to nighttime operations (Criteria A and D).**

Leucadia and Solana Beach – Bluff Receptors

Sensitive noise receptors at these sites are residences located on bluffs above the sand placement sites. Bluffs are on average 40 feet above the beach. Ambient surf noise levels at these residences are estimated at 63 to 66 dBA L_{eq}. Although these homes are also adjacent to the beach, the topography and a slightly greater distance from the residences to the sand replenishment areas result in more noise attenuation. Sand placement activities are expected to generate noise levels of 79 dBA L_{eq} at the edge of the bluff. It should be noted that the equipment noise would drop by 5

dB as soon as the direct line of sight to the receptor is broken. This is expected to occur at a point approximately 10 feet back from the edge of the bluff. Noise levels at the actual residential structures on the bluffs along the Leucadia and Solana Beach placement sites would vary. However, when averaged over an 8-hour period, sand placement activities would include some periods with little or no equipment noise, as described under Alternative 2A. Therefore, daytime sand placement activities would fall within the allowable construction noise level of 75 dBA $L_{eq(8)}$.

There could be materials placement during nighttime hours, and this change in noise environment is anticipated to disturb the sleep of some residents on the bluffs in both sites when within 100 feet of the activity. A noise variance would be required to conduct nighttime sand placement. To minimize impacts to individual residents, they would be notified 1 week in advance of nighttime construction work that would occur within 100 feet, and work would last no longer than 3 consecutive nights within 100 feet (PDF-62). **No substantial adverse impacts would occur under NEPA. Impacts would be considered significant under CEQA for nighttime sand placement (Criteria A and D).**

Torrey Pines Beach

The nearest residential receptors to this sand placement site front Carmel Valley Road and are approximately 2,000 feet to the north and east. Two major roadways and a rail line separate these receptors from the beach area. Even under favorable atmospheric conditions for noise transmission, project-related construction noise may only be faintly heard at these receptors. The placement site is located within a California State Park, which does not limit construction hours or have noise limits. Because there are no restrictions at the site and noise would be heard at the nearest residences only faintly, if at all, **impacts would not be substantially adverse and would be less than significant under CEQA (Criteria A and D).**

SO-5 and SO-6

The stockpile area at SO-5 is located approximately 2,500 feet from the nearest beachfront residents at the closest point in the City of Del Mar. Beachfront residents located adjacent to sand placement sites associated with SO-6 would be located a minimum of 3,350 feet away in the community of Cardiff. Even with the normal prevailing onshore wind, noise associated with offshore placement activities at these locations would not be readily audible at sensitive receptors. **Impacts would not be substantially adverse and would be less than significant (Criteria A and D).**

Vibration

The primary vibration source for the proposed project would be construction equipment used for sand-spreading activities. Sand alone, without silt or clay, is a poor medium for the transfer of vibrations, and the activity would not involve pile driving, soil compacting, jack-hammering, or demolition-related activites, which more typically generate vibration. Sensitive receptors in the vicinity of the materials placement sites may be aware of groundborne vibrations if they are within 50 feet of sand-spreading activities, but the vibrations would not be disruptive to residences or other sensitive uses. **Impacts would not be substantially adverse and would be less than significant (Criterion B).**

Alternative 1B

Although Alternative 1B proposes to use the same sand placement sites as Alternative 2A, impacts associated with Alternative 1B would be incrementally less, as less material would be deposited (200,000 fewer cy under this alternative). This may result in placement at fewer sites, a shorter duration for sand placement activities at a given site, or fewer trips to a stockpile location. Regardless, materials placement would occur at nighttime, outside of the hours allowed within the cities of Solana Beach and Encinitas. A variance would be required from the cities if sand placement on a city beach would occur at night, and **impacts would be considered significant under CEQA (Criteria A and D). No substantial adverse impacts would occur.**

Alternative 1A

Alternative 1A proposes to dispose of removed materials at LA-5. There are no sensitive receptors along the barge delivery route or at the site itself. **No noise impacts would occur and, therefore, would not be substantially adverse and would remain less than significant (Criteria A, B, and D).**

No Project/No Federal Action Alternative

The No Project/No Federal Action Alternative would not result in sand placement activities. **The No Project/No Federal Action Alternative would not impact the noise environment or cause ground vibration and, therefore, noise impacts would not be substantially adverse and would remain less than significant (Criteria A, B, and D).**

3.12.4 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

Due to nighttime dredging and materials placement activities, significant impacts have been identified under CEQA for each of the alternatives due to lagoon restoration activities and materials disposal/reuse activities associated with the SELRP. No substantial adverse impacts per NEPA would occur. Design features have been incorporated into the project to minimize equipment noise during construction at nearby residences, including housing exposed engines and ensuring equipment has effective mufflers. At materials placement sites, construction would be limited to 3 consecutive nights within a distance that could disturb sleep at a given residence (100 feet). Even with implementation of these measures, nighttime construction outside of allowed hours would result in significant impacts. Noise walls and limiting dredging and materials placement activities to daytime hours were considered to reduce this impact, but rejected, as described below. Noise impacts from nighttime dredging and materials placement remain significant and unavoidable with implementation of Alternative 2A, Alternative 1B, and Alternative 1A.

The use of noise walls was considered as an option for noise reduction. However, the expanse of the lagoon and the continual moving dredge make the placement of noise walls less effective, also considering that many noise-sensitive receptors are located on the bluffs and hillsides surrounding the lagoon and would not receive beneficial noise reduction from a noise wall located at lower elevations. At sand placement sites, the active work areas on the beaches would shift approximately 100–200 feet per day. The construction of noise walls is not efficient when left in place for a very short time before needing to be removed and relocated to another location to keep pace with the noise source. For these reasons, the use of noise walls to reduce noise levels at sensitive receptors during nighttime construction activities was found less effective than controlling noise at the mobile noise source, such as with engine enclosures, where possible (e.g., on dredge equipment).

Limiting dredging and materials placement activities to daytime hours was considered to reduce significant impacts associated with nighttime construction to less than significant. If such limits were implemented, however, overall construction time to implement the SELRP would be extended substantially. Dredging equipment operates most efficiently if run continually since dredged material is entrained in a slurry of water and sand and transported through a pipeline and into a barge. Once at a placement site, the material is again transported through a pipeline to the disposal/placement site in a slurry mix of water and sand (e.g., offshore, nearshore, or beach). If dredging is halted once initiated, the pipes must be cleared to avoid having sand settle out and clog pipelines. Therefore, the efficiency of dredging operations is decreased substantially as pipelines are cleared and then primed at the end and start of each dredge period. In addition, for sand placement to occur at sites not directly adjacent to the dredge area, material is placed into a

barge and then transported to the placement site. Once at the site, the material is offloaded through a second pipeline. For beach placement, spreading the material and potentially extending the discharge pipeline must occur before another barge load can be placed on the beach. The sequential nature of beach placement means that if activity is limited to daytime hours and a placement cycle can take up to 5–6 hours, then only a single cycle could occur within a typical 8-hour workday as opposed to completing 4–5 placement cycles within a 24-hour period with continuous dredging/placement activities. This substantial reduction in efficiency leads to an even more substantial increase in schedule. The offshore/nearshore disposal and beach disposal require the installation of pipelines in the surf zone. When these pipelines are left in place in high wave environments they can be buried, broken, or plugged; therefore, less exposure time means less chance of those problems. Extending the schedule also exposes the public to a longer period of equipment and pipe on the beach (at least three times longer). Extending the schedule would also require longer periods of inundation within the lagoon, resulting in potentially higher impacts to vegetation, noise-sensitive species, and trails and recreational amenities. Extending the schedule would also lead to substantially higher construction cost.

3.12.5 Level of Impact after Mitigation

CEQA conclusions: Noise impacts associated with nighttime implementation of the SELRP would be significant and cannot be mitigated to less than significant.

NEPA conclusions: No substantial adverse noise impacts would occur with implementation of the SELRP.

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